# Climatological Data for December, 1910.

## DISTRICT No. 10, GREAT BASIN.

ALFRED H. THIESSEN, District Editor.

### GENERAL CLIMATOLOGICAL CONDITIONS.

The weather during December, 1910, was generally pleasant and unusually warm. During the middle of the month foggy weather was reported at many stations in the Utah and Nevada areas, and during the fore part of the month in the Oregon area. In the Utah area it was the warmest December but one in 20 years, while December, 1909, was the coldest. In Nevada the temperature averaged about 2.5° above normal and 10° higher than during December last year. The precipitation for the month was above normal somewhat, but averaged only about one-half as much as that of December, 1909.

### TEMPERATURE.

The mean temperature for the district for December was 31.1°, which was about 3° above normal. The highest mean temperatures were recorded in the sheltered valleys of northern Utah and in the southern portions of the Nevada and the Utah areas. The greatest plus departures occurred in the Salt Lake and Utah Lake Valleys of Utah and in the Idaho and Wyoming areas. The minus departures were small and occurred at only a few stations in the extreme western portion of Utah.

The mean temperatures at the various stations ranged from 20° at Cokeville, Wyo., to 39.5° at Battle Mountain, Nev., where the temperature averaged 8.4° above normal, being the greatest plus departure for the month. The greatest minus departure was 2.1° at Frisco, Utah.

As a rule, the first half of the month was warm, the highest temperatures being recorded on various dates from the 1st to the 12th. The highest temperature reported was 74° at Battle Mountain, Nev., on the 2d, and at Iosepa, Utah, on the 8th. After the 15th the temperature fell promptly, and averaged normal or slightly below for the remainder of the month. The lowest temperatures were recorded in the last decade. The lowest was 13° below zero at Scipio, Utah, on the 22d. Only 12 stations out of 71 reported temperatures of zero or below.

### PRECIPITATION.

The precipitation for the district averaged only slightly above normal. The map of precipitation shows a remarkably even distribution, which is unusual. The largest amounts fell on the western slope of the Wasatch Mountains, in Utah, and in the extreme western portion of Nevada and eastern portion of California. Most stations reported amounts above normal. At those stations reporting amounts below normal the deficiencies were small. In the Idaho, Oregon, Wyoming, and California areas good amounts were measured.

The section director of Utah, in referring to the precipitation of that area, says:

Contrary to the usual rule, the mountain districts did not receive the greatest amount of precipitation; but stations well scattered in all parts of the State are among those receiving heavy precipitation. However, those stations showing least precipitation are fairly well confined to the more level portion of the State and more or less distant from the mountains. The chronological precipitation distribution shows a dry week from the 12th to the 19th, but otherwise no long spells occurred without rain or snow. A general rain fell on the 3d, and general precipitation, mostly rain, fell from the 9th to the 12th. During the last 11 days of the month light scattered snows occurred nearly every day, some stations reporting several inches on the 19th and 21st, just previous to the hardest cold snap of the month.

The section director of Nevada reports:

The number of rainy days was about normal, and the cloudiness was nearly normal in the south portion, but greater than normal elsewhere. As usual, the precipitation was heaviest on the eastern slope of the Sierra Nevada Mountains. Moderate amounts fell in parts of the west and north portions and in the extreme south. Most of the moisture fell during the first half of the month, and especially on the 2d and 3d, and from the 9th to the 12th.

### SNOW.

The depth of snow at the higher altitudes on December 31, 1910, was less than it has been for years. Those correspondents who have ventured a prediction say that there will be a scarcity of water for irrigation during the coming season.

In the Utah area the ground was frozen in the higher regions, but the more level portions were bare of snow and unfrozen. Very nearly all correspondents reported amounts in the mountains below the average and below those observed on the last of December, 1909.

In the Nevada area most of the precipitation was in the form of rain. The average depth of snow for the month at the mountain stations was about 6 inches. This is only one-half the amount that fell in November. There was practically no snow on the ground at these stations on December 31, 1910, while the normal depth on that date ranges from 10 to 30 inches.

### GREAT SALT LAKE.

The Weather Bureau established a gauge at Great Salt Lake in July, 1903, when the lake level was 0.8 foot. The reading on December 31, 1910, was 5.1 feet. During this period the highest reading was 7.1 feet on May 15, 1910, and the lowest, 1.1 below the zero of the gauge in November, 1905. The following table gives the average, highest, and lowest for each year since 1903:

| | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 | 1910 |
|---|---|---|---|---|---|---|---|---|
| | *Feet.* | *Feet.* | *Feet.* | *Feet.* | *Feet.* | *Feet.* | *Feet.* | *Feet.* |
| Averages | | 0.4 | −0.1 | 0.3 | 2.5 | 3.5 | 4.9 | 6.0 |
| Highest | 0.8 | 1.5 | 0.8 | 1.4 | 3.8 | 4.1 | 5.7 | 7.1 |
| Lowest | −0.8 | −0.5 | −1.1 | −1.0 | 0.5 | 3.0 | 3.4 | 5.0 |

## WEATHER BUREAU RECORDS AND THEIR USE.

W. W. MCLAUGHLIN, U. S. Irrigation Engineer, Logan, Utah.

The increasing activity in dry farming and the rapid development of irrigation enterprises in Utah during the past few years have created an extensive demand upon the part of the layman and the investor for information of the precipitation at various points in this State. With a comparatively small number of local observation stations of the Weather Bureau, it is often necessary to use the records obtained in one place as a basis of what may be anticipated at an adjoining place. These records have been used in many instances by persons not familiar with the many conditions influencing precipitation and the results arrived at by the layman have in most cases been erroneous. Several years' investigation of the precipitation records of this intermountain country has indicated to the writer that with our diverse topography and changeable air circulation there are several physical conditions that must be known and constantly kept in mind if it is wished to approximate the precipitation of one place from the records of another.

It is the wish of the writer in this article to impress upon the reader the importance of a proper understanding of this question and point out some of the more important physical features that influence local precipitation. It is not the purpose of this article to point out all the features which influence precipitation but only a few of the more important.

PROXIMITY TO MOUNTAIN RANGES.

The influence of mountain ranges is more pronounced on the western side of the mountain than upon the eastern side, and the closer we are to the mountains the greater the precipitation. For example: Ogden Station No. 1, at the base of the Wasatch Mountains, has an average annual precipitation of approximately 25 per cent more than Ogden Station No. 2. The latter station is at the Union Depot and about 2 miles west of the base of the mountains. A second and more pronounced example is that of Fillmore and Deseret, in Millard County. Fillmore, at the base of the mountains, has an average annual precipitation twice as great as Deseret. Geographically, there is very little difference in the location of these stations, but Deseret is in the valley and a few miles from the base of the mountains. It is also a fact verified from the records that the closer we are to the mountains the more frequent the precipitation, and especially is this true of local thunderstorms.

EASTERN OR WESTERN SLOPE OF THE MOUNTAINS.

The greater number of moisture-laden air currents of Utah come from the west, and, as a result, the western side of the mountain is the wet side. A summary of the precipitation records up to and including the year 1908 shows that the western half of the State has an average annual precipitation of 12.8 inches, while the annual average precipitation for the eastern half of the State is 6.4 inches. It is also observed from the same records that there is a material variation in the monthly distribution of this precipitation in those localities. On the western side the moisture is precipitated quite evenly during the months of November to May, inclusive, with a maximum precipitation during the month of March, or at the beginning of the growing season. On the eastern side, the precipitation is evenly distributed during August to November, inclusive, with a maximum precipitation during August and September, or at the close of the growing season. The records indicate that only about 11 per cent of the annual precipitation for the eastern slope occurs during December and January, or at a time when the precipitation would probably be in the form of snow. On the western slope about 17 per cent of the annual precipitation, or, expressed in inches, about three times as much moisture, falls during these months as falls on the eastern slope. This last fact is of importance when considering the amount of precipitation as a factor in stream flow. It is a well-known fact that the streams in the eastern part of Utah are subject to numerous floods during the summer and fall, with a high and rapid spring flow. The streams of the western part of the State are not subject to summer and fall floods, and maintain a more uniform flow in the spring and summer. This condition bears out the popular belief that the snow which falls before the middle of January becomes well packed and melts slowly, while the snow which falls in February and March remains more loose and melts very rapidly. The records of the Weather Bureau would indicate that the western slope of the mountains is best situated for an abundant supply of water in the streams during the late summer than is the eastern slope.

PRECIPITATION ON DIFFERENT SIDES OF THE SAME VALLEY.

This condition is usually the result of eastern and western slopes. To illustrate, we may take the stations of Manti and Richfield. The former is on the eastern side of the valley and the latter on the western side. The average annual precipitation at Manti is 10.5 inches, while at Richfield it is about 6.7 inches. These two stations are both at the foot of the mountains, but the former with a western exposure and the latter with an eastern exposure. In some few instances this relation may be reversed, due to the following fact:

LOCAL AIR CURRENTS INFLUENCE THE AMOUNT OF PRECIPITATION.

In several sections of Utah there are well-known mountain passes through which local air currents pass, and the effect of this condition in influencing precipitation is more pronounced with local storms and summer showers than with general storms. In some instances it is possible to have more precipitation over a small area on the western side of the valley than on the eastern side of the same valley.

ELEVATION AS A FACTOR IN AMOUNT OF ANNUAL PRECIPITATION.

From an agricultural standpoint the influence of this factor upon the amount of annual precipitation is of little importance except when considering the form of precipitation and its relation to water supply for irrigation. It is a commonly accepted idea, and probably a proven fact, that the precipitation increases with elevation, but in this State this condition is so overshadowed by other features that elevation in relation to quantity of precipitation may be disregarded. This may be illustrated by the following: At Levan, with an elevation of 5,010 feet, the annual average precipitation is 15.1 inches, while at Loa, with an elevation of 7,000 feet, there is an annual average precipitation of 6.5 inches. Soldier Summit, at an elevation of 7,054 feet, has only about two-thirds the annual average precipitation of Salt Lake City, which is at an elevation of 4,224 feet. The greater annual average precipitation at Levan and Salt Lake is accounted for from the fact that both are on the western slope and near the base of the mountains.

As stated previously in this article, it was not my intention to point out all the factors which influence the distribution of precipitation in Utah, but rather to emphasize the fact that there are physical features which exert a controlling influence when attempting to adapt the precipitation records of one place to a second place, and that these features must be taken into account.

It is a fact that the distribution of the annual and monthly precipitation is influenced greatly by these physical conditions. That these physical features are also a factor in anticipating the form of precipitation—that is, whether snow or rain—is also shown from a perusal of the records

It is finally suggested that any one desiring an accurate estimate of the precipitation at any point in the State would do well to consult the section director of the Weather Bureau at Salt Lake City, Utah, who will willingly answer inquiries asked either in person or by letter.

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## SEASONAL PRECIPITATION MEASUREMENTS.

By J. CECIL ALTER, Observer, Salt Lake City, Utah.

The first general attempt to obtain seasonal precipitation records in isolated regions has just been concluded, with a measure of success that seems to warrant the giving of much more attention to this matter. The feasiblity of securing such records has been fairly well demonstrated by this season's trial, which was conducted along lines suggested by the writer, but under the supervision of Mr. A. H. Thiessen, section director in charge of the Salt Lake City office of the Weather Bureau.

No new tests were made of the comparative accuracy of the oil-film one-measurement gage as compared with the regular pattern of Weather Bureau gage, from which measurements are made after each rain, as it was thought that the slight discrepancy shown at the first trial, as reported in the Monthly Weather Review for November, 1907, is